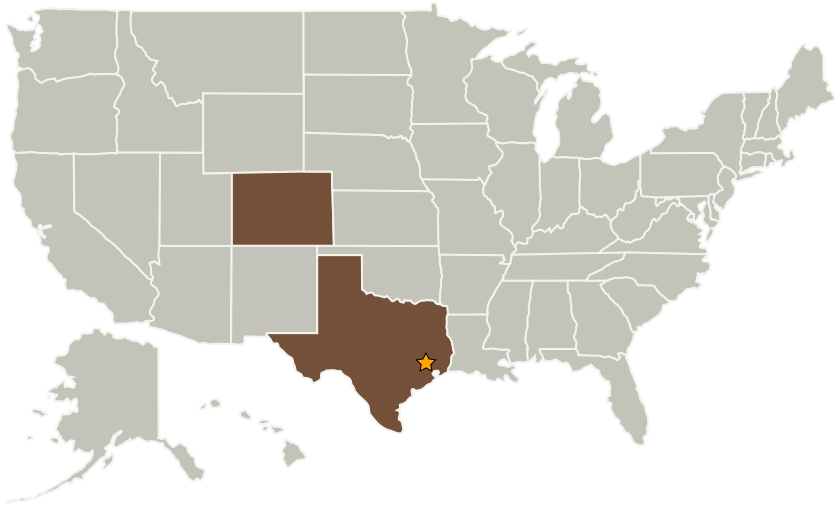
Chromatid Painting for Chromosomal Inversion Detection, Phase I

Completed Technology Project (2009 - 2009)

Project Introduction

We propose a novel approach to the detection of chromosomal inversions. Transmissible chromosome aberrations (translocations and inversions) have profound genetic effects, such as disrupting regulatory sequences that control gene expression, or creating genetic chimeras. These chromosome aberrations play a causative role in cancer, and they are induced by radiation. As such, chromosome aberrations are relevant to three NASA needs, biodosimetry, analysis of astronaut lymphocytes for cumulative radiation damage, and space radiation risk modeling. Of all structural chromosomal anomalies, inversions -- a reversal of orientation of material within a chromosome -- are the most difficult to detect. This is especially true of small inversions, most of which are invisible to all current cytogenetic techniques. Yet small inversions are likely the most transmissible (nonlethal) form of chromosomal damage, so they persist, a feature which lends credence to their use in retrospective biodosimetry. This Phase 1 project is intended to provide a proof-of-principle demonstration of a new method of molecular cytogenetics that will permit highly sensitive inversion detection. The project will help us to perfect our bioinformatics strategy for probe design, optimize probe labeling reactions, refine hybridization conditions, and establish a procedure for cost analysis. In Phase 2, we will scale-up probe production to make whole chromosome analysis possible. This next step, although conceptually simple, relies entirely on the processes devised and tested in Phase 1. Moreover efficient, cost-effective probe-making will be essential to commercialization (Phase 3). The technology readiness level at the end of the Phase 1 contract is expected to be 4-5, i.e. validated in laboratory and relevant environments.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
KromaTiD, Inc.	Supporting Organization	Industry	Fort Collins, Colorado

Primary U.S. Work Locations	
Colorado	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX10 Autonomous Systems
  - TX10.1 Situational and Self Awareness
    - TX10.1.5 Event and Trend Identification